



# HSI GEOTRANS

A TETRA TECH COMPANY

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January 28, 1999

Lockheed Martin Corporation  
West Coast Project Office  
2550 N. Hollywood Way, 3<sup>rd</sup> Floor  
Burbank, California 91505

Attention: Mr. Eric Hodder  
Project Coordinator

Subject: November 1999 Data Report  
Water Supply Contingency Plan  
Production Well Sampling Program  
Crafton-Redlands Plume Project

Dear Mr. Hodder:

This report presents a summary of results of the Water Supply Contingency Plan production well sampling for the month of November 1999. The Water Supply Contingency Plan (WSCP) was prepared by Lockheed Martin Corporation and submitted to the State of California Regional Water Quality Control Board (RWQCB) Santa Ana Region on September 30, 1996. The plan was conditionally approved by the RWQCB in a letter dated March 6, 1997. The WSCP for the Crafton-Redlands Plume was prepared to address maintenance of water supply to purveyors in the event that wells became impacted with trichloroethene (TCE) from the Crafton-Redlands TCE Plume. A summary of key dates and WSCP sampling program evolution is provided on Table 1.

The locations of the WSCP wells and analytical results for the November 1999 sampling event for TCE and perchlorate are shown on Figures 1 and 2, respectively. Table 2 presents a summary of analytical tests performed on each WSCP well and water system sampling point. The sampling frequency of each well is once a month for the first year. More frequent sampling, if required, is based on the analytical results as outlined in the WSCP TCE and perchlorate decision matrices, provided as Figures 3 and 4, respectively. The perchlorate decision matrix was presented in the *Perchlorate Work Plan and Schedule*, which was submitted, to the RWQCB on August 15, 1997. The RWQCB approved the

Perchlorate Work Plan on October 31, 1997. Table 3 presents a summary of the wells sampled twice monthly according to the decision matrices.

## **RESULTS**

A summary of the analytical results for the November 1999 WSCP sampling event for TCE and perchlorate is shown on Figures 1 and 2, respectively, and presented on Table 4. Available groundwater elevation data is provided on Table 5. The water sampling field forms are provided in Attachment A. Chain-of-custody, laboratory data sheets, and Level III Modified laboratory quality assurance/quality control (QA/QC) documentation is provided in Attachment B.

### ***Trichloroethene***

Three groundwater samples collected in November met or exceeded 2/5<sup>th</sup> the MCL for TCE (2.0 µg/L) including: Gage 26-1 (9.5 µg/L), Gage 27-1 (6.6 µg/L), and City of Loma Linda (COLL) Richardson #2 (3.7 µg/L). Gage 26-1 and Gage 27-1 were placed into TCE treatment in May 1999; therefore, they will be sampled once a month.

The TCE impacts observed at Gage 29-2 and Gage 29-3 are partially attributed to the Norton AFB plume and partially attributed to the Crafton Redlands plume, thus Gage 29-2 and Gage 29-3 are sampled twice a month for TCE when active. In November Gage 29-2 and Gage 29-3 were off line and not sampled.

The COLL Richardson #2 well is operated in conjunction with the COLL Richardson #1 well in accordance with the California Department of Health Services (DHS) approved perchlorate-blending plan. Both Richardson #1 and Richardson #2 had been off line for approximately 2 weeks when the sampling was performed on November 17, 1999. Purge water from these wells was pumped to waste and not into the system. Richardson #2 has historically shown elevated concentrations of both TCE and perchlorate at the beginning of a pumping cycle and concentrations reduce with time. Because the Richardson #2 well was not pumping into the system a confirmation sample from Richardson #2 was not collected.

The COLL Richardson Blend and the COLL Mountain View Blend – Lawton sampling points were not sampled in November because only the Richardson #3 well was pumping into the Richardson system. The water passing through the Lawton Booster was from only well Richardson #3.

### ***Perchlorate***

In the November WSCP sampling, perchlorate was detected at or above 75 percent (13.5 µg/L) of the PAL in Gage 51-1 (16 µg/L) and COLL Richardson #2 (41 µg/L).

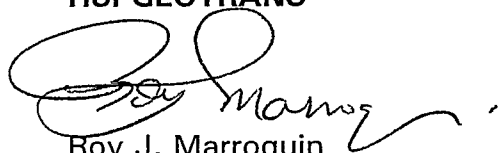
Gage 29-2, Gage 29-3, Gage 51-1, and COLL Mountain View #2 wells are currently being sampled on a twice a month basis for perchlorate, if active.

The perchlorate impacts observed at COLL Richardson #2 are consistent with historic data when the well is sampled shortly after the well is turned on. As stated above, water from Richardson #2 was not pumped into the system and therefore a confirmation sample was not collected.

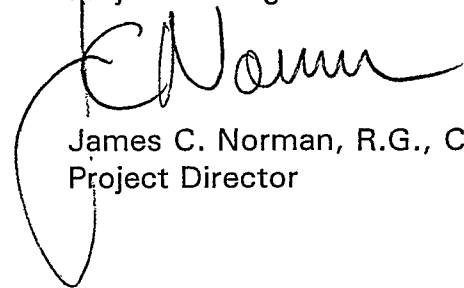
***CLOSING***

HSI GeoTrans greatly appreciates being of continued service to Lockheed Martin Corporation on this project. Should you have any questions or comments, please do not hesitate to call.

Sincerely,  
**HSI GEOTRANS**



Roy J. Marroquin  
Project Manager



James C. Norman, R.G., C.HG.  
Project Director

TABLES

**TABLE 1**

**KEY PROJECT DATES AND WSCP SAMPLING PROGRAM EVOLUTION**

August 2, 1996, the RWQCB – Santa Ana Region requested Lockheed Martin to submit a conceptual Water Supply Contingency Plan.
September 30, 1996, Lockheed Martin submitted the Water Supply Contingency Plan (WSCP) to the RWQCB – Santa Ana Region.
March 6, 1997, the RWQCB conditionally approved the WSCP, which included sampling eight production wells (City of Loma Linda Richardson #1, Richardson #2, Mountain View #1, Mountain View #2, Victoria Farms Mutual Water Company Wells #1 and #3, and Southern California Edison #1 and #2).
June 1997, Victoria Farms Mutual Water Company was connected to City of San Bernardino Water. Pumping ceased at VFMWC #1 and #3, and the two wells were removed from the program.
June 1997, sampling of SCE #1 was discontinued because it is not operated on a regular basis. The WSCP consists of five wells, including COLL Mountain View #1 and #2, COLL Richardson #1 and #2, and SCE #2 (AUX).
August 1997, the WSCP was expanded due to the detection of perchlorate in municipal supply wells in the Bunker Hill Basin. Twenty-six wells were added to the WSCP including nineteen City of Riverside wells, five City of Redlands wells, and two Loma Linda University wells, for a total of 31 wells.
October 1997, three City of Riverside water system sampling points were added to the WSCP, including the Gage system pipeline (Gage Delivery), the Waterman system pipeline (Iowa Booster), and the sampling station measuring outflow from the Linden and Evans Reservoirs (7 <sup>th</sup> & Chicago).
March 1998, two City of Loma Linda water system sampling points were added to the WSCP, including the Mountain View system pipeline (Mountain View Blend at Lawton) and the Richardson system pipeline (Richardson Blend).
June 1998, one City of Riverside irrigation water system sampling point (Gage Arlington) and one additional City of Loma Linda water system sampling point (Mountain View Blend at Timoteo) were added to the WSCP.
December 1998, the new COLL Richardson #3 well was added to WSCP Sampling Program.
May 1999, Sampling of Mountain View Blend at Timoteo was discontinued because it does not represent a blend sample of the Mountain View pipeline system.

TABLE 2

## WSCP PRODUCTION WELL SAMPLING PROGRAM

HSI#	Well Name	Perchlorate	TCE
City of Loma Linda			
692	Mountain View #2	X	X
693	Richardson #1	X	X
694	Richardson #2	X	X
707	Richardson #3	X	X
City of Loma Linda Water System Sampling Points			
2967	Mountain View Blend - Lawton	X	X
2968	Richardson Blend	X	X
Southern California Edison			
554	SCE#2(AUX)	X	X
Loma Linda University			
267	LLUniv Anderson #2	X	
717	LLUniv Anderson #3	X	
City of Riverside (Gage System)			
252	Gage#26-1	X	X
258	Gage#27-1	X	X
259	Gage#27-2	X	X
260	Gage#29-1	X	X
219	Gage#29-2	X	X
220	Gage#29-3	X	X
218	Gage#30-1	X	X
214	Gage#31-1	X	X
215	Gage#46-1	X	X
253	Gage#51-1	X	X
216	Gage#56-1	X	X
257	Gage#66-1	X	X
644	Gage#92-1	X	X
641	Gage#92-2	X	X
642	Gage#92-3	X	X
City of Riverside (Waterman System)			
273	Hunt#6	X	
271	Hunt#10	X	
272	Hunt#11	X	
City of Riverside Water System Sampling Points			
2946	Iowa Booster (Waterman)	X	X
2947	Gage Delivery (Gage)	X	X
2948	7th & Chicago (Reservoir)	X	X
3018	Gage Arlington	X	
City of Redlands			
542	COR Church St	X	
2673	COR#38	X	
535	COR Mentone Acres	X	
29	COR Orange st	X	
74	CORRees	X	X

## Notes:

TCE = Trichloroethene

Perchlorate analyzed using DHS Method (EPA 300.0 Modified)

TCE analyzed using EPA Method 502.2

TABLE 3

**WSCP PRODUCTION WELL SAMPLING PROGRAM  
NOVEMBER 1999 WELLS SAMPLED TWICE MONTHLY**

HSI#	Well Name	Perchlorate	TCE
City of Loma Linda			
692	Mountain View #2	X	
City of Riverside (Gage System)			
219	Gage #29-2	X	X
220	Gage #29-3	X	X
253	Gage #51-1	X	

**Notes:**

TCE = Trichloroethene

Perchlorate analyzed using DHS Method (EPA 300.0 Modified).

TCE analyzed using EPA Method 502.2.

**TABLE 4**  
**WSCP PRODUCTION WELL SAMPLING PROGRAM**  
**NOVEMBER 1999 DATA RESULTS**

HSI#	Well Name	Sample Date	Perchlorate (µg/L) Del Mar	TCE (µg/L) Del Mar
<b>City of Loma Linda</b>				
692	Mountain View #2	11/8/99	8.8	0.54
692	Mountain View #2*	11/17/99	7.8	NA
693	Richardson #1	11/17/99	7.8	ND(0.5)
693	MUN-763	11/17/99	7.4	ND(0.5)
694	Richardson #2	11/17/99	41	3.7
707	Richardson #3	11/10/99	ND(4)	ND(0.5)
<b>City of Loma Linda Water System Sampling Points</b>				
2967	Mountain View Blend-Lawton	NS	NS	NS
2968	Richardson Blend	NS	NS	NS
<b>Mountain View Power (Formerly Southern California Edison)</b>				
554	SCE#2(AUX)	11/4/99	ND(4)	ND(0.5)
<b>Loma Linda University</b>				
267	LLUniv Anderson #2	11/4/99	ND(4)	NA
717	LLUniv Anderson #3	11/4/99	ND(4)	NA
<b>City of Riverside (Gage System)</b>				
252	Gage#26-1 <sup>b</sup>	11/3/99	10	9.5
258	Gage#27-1 <sup>b</sup>	11/3/99	7.2	6.6
259	Gage#27-2	NS	NS	NS
260	Gage#29-1	11/4/99	9.1	ND(0.5)
219	Gage#29-2	NS	NS	NS
219	Gage 29-2*	NS	NS	NS
220	Gage#29-3	NS	NS	NS
220	Gage#29-3*	NS	NS	NS
218	Gage#30-1	11/3/99	ND(4)	ND(0.5)
214	Gage#31-1	11/3/99	ND(4)	ND(0.5)
215	Gage#46-1	11/3/99	4.6	ND(0.5)
215	MUN-761	11/3/99	4.4	ND(0.5)
253	Gage#51-1	11/3/99	16	ND(0.5)
253	Gage#51-1*	NS	NS	NA
216	Gage#56-1	11/3/99	ND(4)	ND(0.5)
257	Gage#66-1	11/3/99	10	ND(0.5)
644	Gage#92-1	11/3/99	12	0.90
641	Gage#92-2	11/3/99	ND(4)	ND(0.5)
642	Gage#92-3	11/3/99	ND(4)	ND(0.5)
<b>City of Riverside (Waterman System)</b>				
273	Hunt#6	NS	NS	NA
271	Hunt#10	NS	NS	NA
272	Hunt#11	NS	NS	NA
<b>City of Riverside Water System Sampling Points</b>				
2946	Iowa Booster (Waterman)	11/4/99	ND(4)	ND(0.5)
2947	Gage Delivery (Gage)	11/4/99	5.1	ND(0.5)
2948	7th & Chicago (Reservoir)	11/4/99	ND(4)	ND(0.5)
3018	Gage Arlington	11/4/99	5.1	NA
<b>City of Redlands</b>				
542	COR Church St <sup>a</sup>	NS	NS	NA
2673	COR#38 <sup>a</sup>	NS	NS	NA
535	COR Mentone Acres <sup>a</sup>	NS	NS	NA
29	COR Orange St <sup>a</sup>	11/4/99	ND(4)	NA
74	COR Rees	11/4/99	4.7	ND(0.5)
74	MUN-762	11/4/99	4.7	ND(0.5)

**Notes:**

\* = Twice-monthly sampling result  
 \*\* = Confirmation sampling results  
 \* = Well sampled on quarterly basis, if active  
 ND(4) = Not detected at the specified limit  
 MUN = Duplicate sample collected from the well listed directly above  
 NA = Not Analyzed  
 NS = Not Sampled

TCE = Trichloroethene  
 Perchlorate analyzed using DHS Method (EPA 300.0 Modified)  
 TCE analyzed using EPA Method 502.2  
 b = Gage 26-1 and Gage 27-1 are currently being treated for TCE



TABLE 5

**SUMMARY OF WATER LEVEL MEASUREMENTS  
NOVEMBER 1999 SAMPLING EVENT**

HSI#	Well Name	Measure Date	Depth to Water	Measuring Point Elevation	Groundwater Elevation	Comments
<b>CITY OF LOMA LINDA</b>						
692	Mountain View #2	11/01/99	197	1085	888	Pumping
693	Richardson #1	11/01/99	172	1077	905	Pumping
694	Richardson #2	11/01/99	150	1078	928	Static
707	Richardson #3	11/01/99	166	NA	880	Static
<b>Southern California Edison</b>						
554	SCE#2(AUX)	NM	NM	1100.00	NM	Pumping
<b>Loma Linda University</b>						
267	LLUniv Anderson #2	NM	NM	1075	NM	Pumping
717	LLUniv Anderson #3	NM	NM	1070	NM	Pumping
<b>City of Riverside (Gage System)</b>						
252	Gage#26-1	11/02/99	99.70	1045.33	945.63	Pumping
258	Gage#27-1	11/02/99	92.70	1044.64	951.94	Pumping
259	Gage#27-2	11/02/99	77.80	1044.64	966.84	Static
260	Gage#29-1	11/02/99	94.90	1044.43	949.53	Pumping
219	Gage#29-2	11/02/99	70.20	1046.31	976.11	Static
220	Gage#29-3	11/02/99	71.80	1048.75	976.95	Static
218	Gage#30-1	11/02/99	193.60	1054.17	860.57	Pumping
214	Gage#31-1	11/02/99	105.40	1054.64	949.24	Pumping
215	Gage#46-1	11/02/99	115.00	1065.50	950.50	Pumping
253	Gage#51-1	11/02/99	155.30	1044.64	889.34	Pumping
216	Gage#56-1	11/02/99	166.80	1065.50	898.70	Pumping
257	Gage#66-1	11/02/99	131.60	1044.85	913.25	Pumping
644	Gage#92-1	11/02/99	166.80	1047.78	880.98	Pumping
641	Gage#92-2	11/02/99	184.80	1053.38	868.58	Pumping
642	Gage#92-3	11/02/99	179.70	1058.78	879.08	Pumping
<b>City of Riverside (Waterman System)</b>						
273	Hunt#6	NM	NM	1015.5	NM	Static
271	Hunt#10	NM	NM	1017	NM	Static
272	Hunt#11	NM	NM	1015.7	NM	Static
<b>City of Redlands</b>						
542	COR Church St	Nov-99	113.0	1344.8	1231.8	Static
2673	COR#38	Nov-99	104.0	NA	NA	Pumping
535	COR Mentone Acres	Nov-99	184.0	1506.4	1322.4	Static
29	COR Orange st	Nov-99	135.0	1282	1147.0	Static
74	COR Rees	Nov-99	235.0	1490	1255.0	Pumping

**Notes:**

All measurements reported in feet below measuring point (ft-bmp)

Water level measurements for all City of Loma Linda, City of Riverside, and City of Redlands wells were obtained by purveyor personnel.

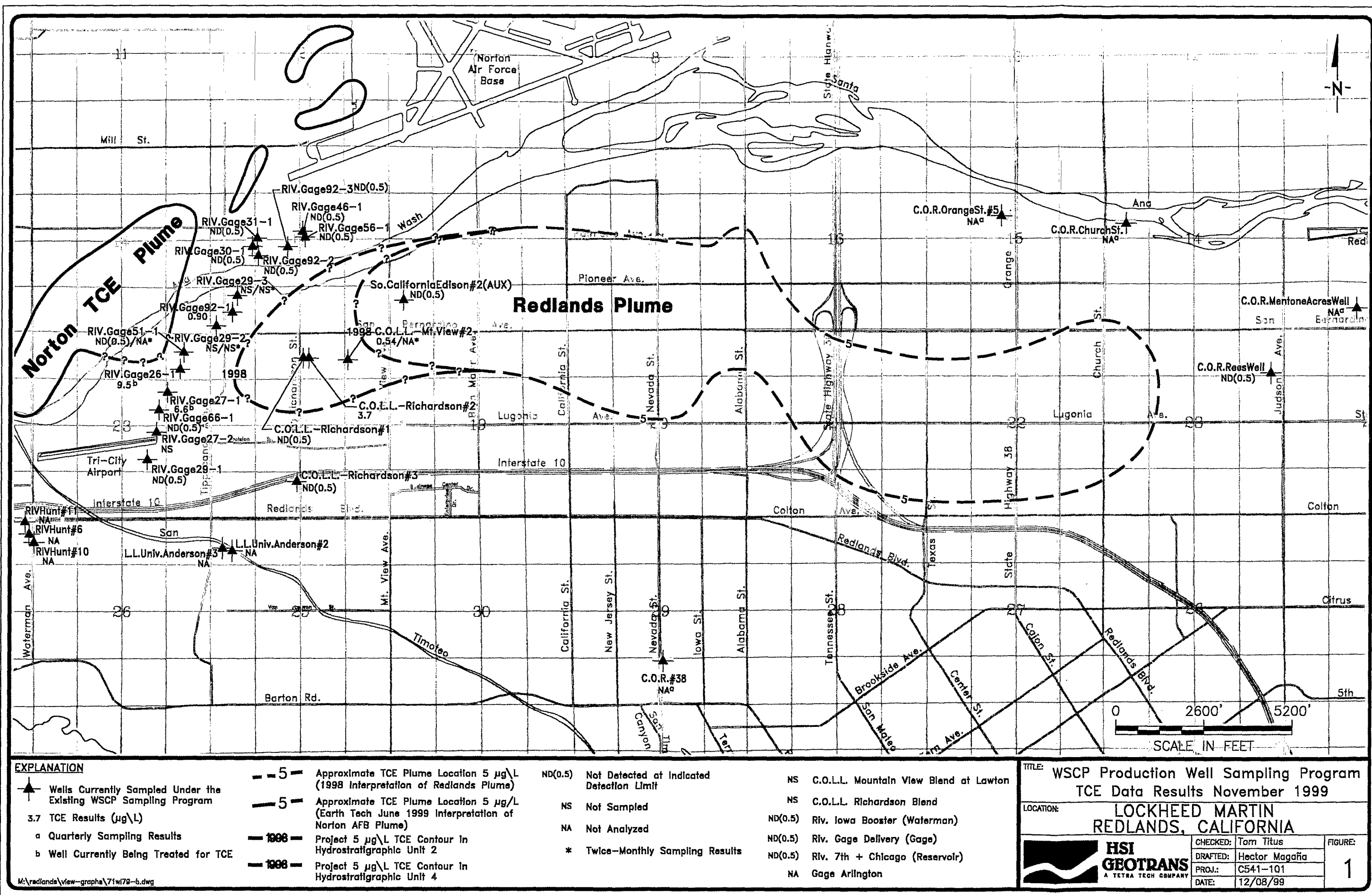
Elevations given in feet above mean sea level (ft-msl)

NM=Not measured

NA=Data not available

Static water levels were allowed to recover a minimum of 30 minutes to obtain a static water level measurement

**FIGURES**



# EXPLANATION

- ▲ Wells Currently Sampled Under the Existing WSCP Sampling Program
- 3.7 TCE Results (µg/L)
- a Quarterly Sampling Results
- b Well Currently Being Treated for TCE

- - 5 - - Approximate TCE Plume Location 5 µg/L (1998 Interpretation of Redlands Plume)
- - 5 - - Approximate TCE Plume Location 5 µg/L (Earth Tech June 1999 Interpretation of Norton AFB Plume)
- - 1998 - - Project 5 µg/L TCE Contour in Hydrostratigraphic Unit 2
- - 1998 - - Project 5 µg/L TCE Contour in Hydrostratigraphic Unit 4

- ND(0.5) Not Detected at Indicated Detection Limit
- NS Not Sampled
- NA Not Analyzed
- \* Twice-Monthly Sampling Results

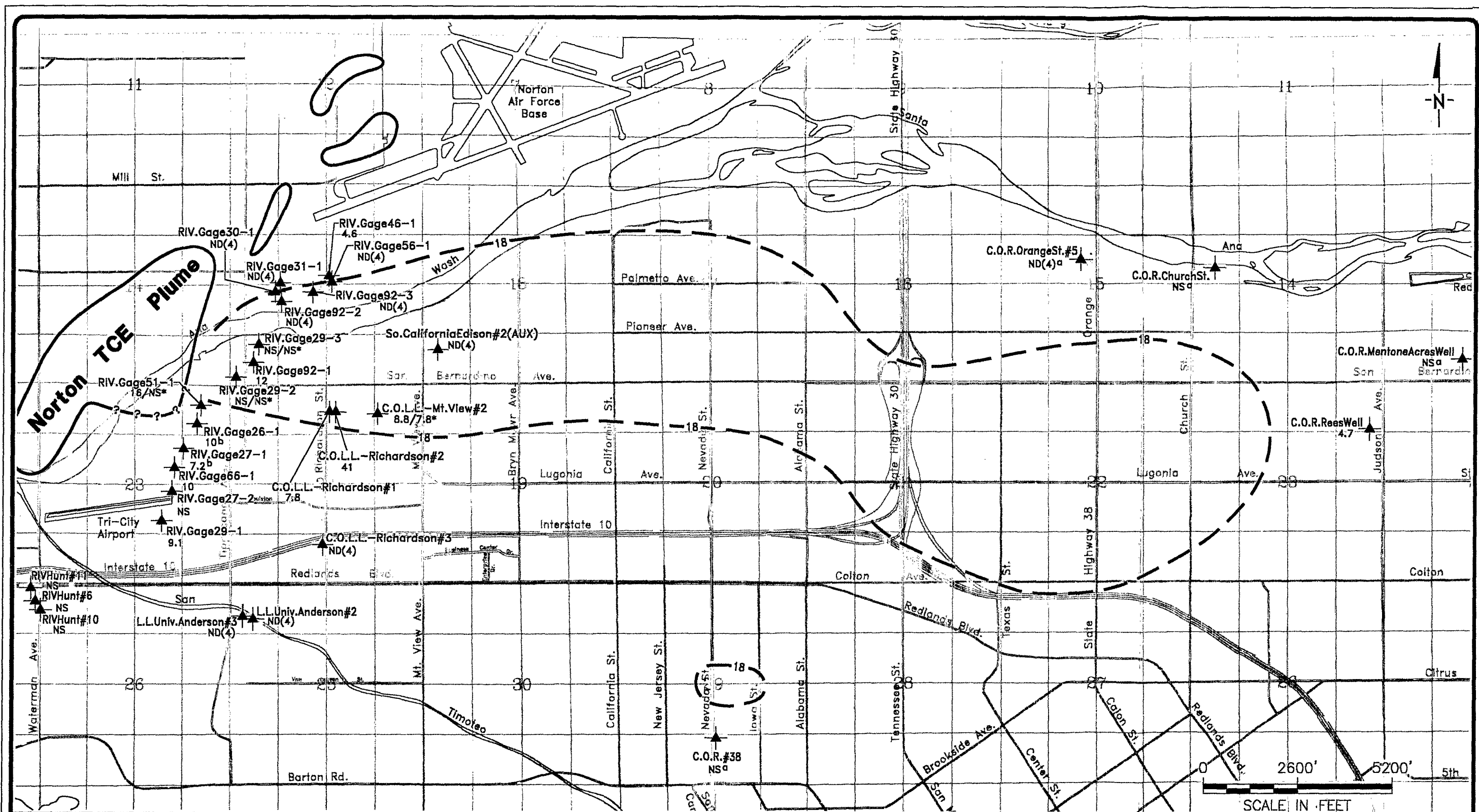
- NS C.O.L.L. Mountain View Blend at Lawton
- NS C.O.L.L. Richardson Blend
- ND(0.5) Riv. Iowa Booster (Waterman)
- ND(0.5) Riv. Gage Delivery (Gage)
- ND(0.5) Riv. 7th + Chicago (Reservoir)
- NA Gage Arlington

TITLE: WSCP Production Well Sampling Program  
TCE Data Results November 1999

LOCATION: LOCKHEED MARTIN  
REDLANDS, CALIFORNIA

CHECKED: Tom Titus	FIGURE: 1
DRAFTED: Hector Magaña	
PROJ.: C541-101	
DATE: 12/08/99	

M:\redlands\view-graphs\71w\72-6.dwg



# EXPLANATION

- ▲ Wells Currently Sampled Under the Existing WSCP Sampling Program
- 18- Approximate 18 µg/L Perchlorate Plume Location (1998 Interpretation)
- 5- Approximate TCE Plume Location 5 µg/L (Earth Tech June 1999 Interpretation of Norton AFB Plume)

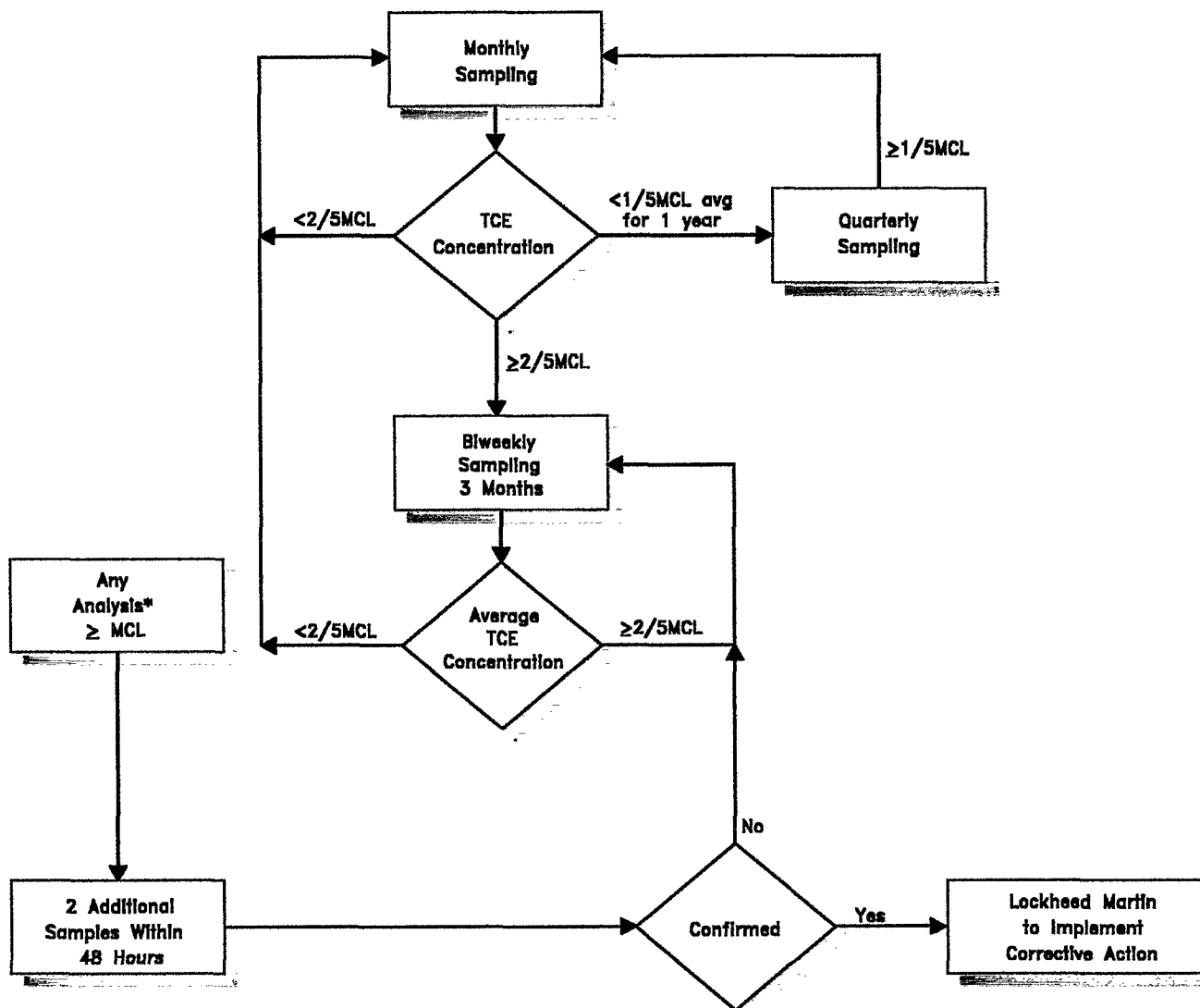
- 9.2 Perchlorate (µg/L) Results
- ND(4) Not Detected at Indicated Detection Limit
- NS Not Sampled
- a Quarterly Sampling Results
- b Well Currently Being Treated for TCE
- \* Twice-Monthly Sampling Results

- NS C.O.L.L. Mountain View Blend - Lawton
- NS C.O.L.L. Richardson Blend
- ND(4) RIV. Iowa Booster (Waterman)
- 5.1 RIV. Gage Delivery (Gage)
- ND(4) RIV. 7th + Chicago (Reservoir)
- 5.1 Gage Arlington

TITLE: WSCP Production Well Sampling Program  
Perchlorate Data Results November 1999

LOCATION: LOCKHEED MARTIN  
REDLANDS, CALIFORNIA


	CHECKED: Tom Titus	FIGURE: 2
	DRAFTED: Hector Magaña	
	PROJ.: C541-101	
	DATE: 12/08/99	



**Footnote:**

\* If, at a specific well, blending is occurring to provide acceptable water for compounds other than TCE, then no corrective action may be necessary as long as the concentration of TCE is less than 5.0 µg/L in the finished water.

TCE MCL = 5 µg/L (California Regulations, Title 22, Division 4, Chapter 15, Section 64444)

TITLE: Decision Matrix for Sampling of Production Wells for TCE from the Crafton-Redlands Plume		
LOCATION: LOCKHEED MARTIN REDLANDS, CALIFORNIA		
 <b>HSI GEOTRANS</b> A TETRA TECH COMPANY	CHECKED: Ron Bruns	FIGURE:  <b>3</b>
	DRAFTED: Hector Magaña	
	PROJ.: N948-101	
	DATE: 09/25/98	



**ATTACHMENT A**  
**GEOLIS FIELD FORMS**

**ATTACHMENT A**

**GEOLIS FIELD FORMS**  
**(Available Upon Request)**



**ATTACHMENT B**

**CHAIN-OF-CUSTODY RECORDS AND  
LABORATORY DATA SHEETS  
QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION**

**ATTACHMENT B**

**CHAIN-OF-CUSTODY RECORDS AND  
LABORATORY DATA SHEETS AND LEVEL III MODIFIED  
QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION  
(Available Upon Request)**